

REMARKS

This communication is in response to the Office Action of May 3, 2007.

The Examiner rejected claims 1-3, 5, 7-9, 10-11, 13 and 15-18 under 35 USC 102(b) over Misawa (U.S. Pat. No. 6,774,946). Claims 4, 6, 12, and 14 were rejected over Misawa in view of Tian (U.S. Pat. No. 6,803,553).

In response to the claim rejections, Applicant has amended independent claims 1 and 10 to include limitations supported by original dependent claims 2, 3, 4, 6, and 9 for a CMOS image sensor embodiment. As described in paragraphs [0005] and [0021], CMOS image imagers consume less power than a CCD image sensor and also have other advantages for mobile devices.

Applicant has further amended the claims to include a limitation that in an image capture mode signals are provided to the processor in a sequential row-by-row basis, which is supported by paragraphs [0022], [0025]-[0026]. In contrast, in a battery charging mode multiple pixels from each column are used to continuously and simultaneously provide continuous current to charge the battery.

New claim 21 was added for a CMOS image sensor having timing and control limitation similar to claims 1 and 10.

Claims 1, 19, 20, 21, and 24 include limitations related to the manner in which the mode of operation transitions to support switching to a battery charging mode whenever an image is not being captured. These limitations are supported by the original claims and also elsewhere in the specification.

Dependent claims 3, 11, and 22 are for an embodiment in which all of the pixels are simultaneously used for charging in the battery charging mode and is supported by paragraphs [0022], [0025]-[0026]. Dependent claim 23 repeats a limitation found in original claim 2.

In the claimed inventions the manner in which the CMOS image sensor is operated fundamentally changes to support efficient charging of the battery in the battery charging mode. In an image capture mode, the signal processor receives image signals from the image sensor in a row-by-row basis. As described in paragraphs [0025]-[0026], in a sequential row-by-row readout one pixel in each column transmits its signal to the column readout circuit at a single time in order to readout a single row of pixels. After one row of pixels is read out, a subsequent row of pixels transmits signals to the column readout circuit, and so on, one row of pixels at a time. In

the claimed inventions the effectiveness with which the battery is charged is improved by operating the pixels with multiple pixels per column providing a simultaneous and continuous output to generate a continuous current to charge the battery. As further specified in dependent claims 3, 11, and 22, in one embodiment all of the pixels in each column simultaneously and continuously provide a continuous current to charge the battery.

Claims 1, 19, 20, 21 and 24 also include limitations related to an embodiment in which when the image sensor is not capturing an image it switches to a battery charging mode to charge the battery, as described in paragraph [0019]-[0020]. Automatically switching between the image capture mode and the battery charging mode permits nearly continuous charging of the battery aside from those times when images are being captured.

Misawa discloses a CCD camera that utilizes a CCD architecture with vertical and horizontal shift registers, a CCD readout timing, and other features different from CMOS image sensors. CCD cameras are also well known to have a comparatively high power consumption, as described in paragraph [0005] of Applicant's specification.

Claims 1, 19, 20, 21, and 24 have limitations not found in Misawa regarding the switching back and forth between an image capture mode and a battery charging mode. Misawa does not directly switch back and forth between a battery charging mode and an image capture mode when a user takes a picture. In Misawa, the CCD camera is placed in a sleep mode whenever the battery is being charged, as illustrated in Figure 6 and further described in column 6, lines 31-38 ("camera circuits, with the exception of CPU 10, control circuit 22, and power supply control circuit 23, are turned off"). Thus, in Misawa, the camera must be put to sleep whenever the battery is being charged by the CCD. CCD cameras have a high power consumption and Misawa explicitly states in column 6, lines 3-5 that sufficient charging is only possible if circuit elements are put to sleep. Battery charging also does not occur in Misawa unless a power supply switch is turned off, as described in column 6, lines 6-8. Thus, in Misawa a user must first turn a power supply switch off and then the camera enters a sleep mode before any battery charging can take place. Thus, the CCD camera of Misawa, which places the camera into a sleep mode, would not automatically switch back and forth between image capture and battery charging modes when a user takes a sequence of images. Thus Misawa would not guide one of ordinary skill in the art to implement a CMOS image sensor in the manner of claims 1, 19, 20, 21, and 24.

Claims 1, 10, and 21 also recite a limitation that the “timing/control circuit directs multiple pixels in each individual column to simultaneously and continuously provide continuous current to the battery charger.” Misawa does not satisfy this element of claims 1, 10, and 21. Misawa teaches accumulating charge in photodiodes and using a “readout pulse” to readout accumulated charge from photodiodes to an accumulation line, as described in column 5, lines 58-65. However, the description in column 5, lines 58-65 refers to the output of charge in the past tense (“has accumulated”) and the description of the pulse readout is consistent with a single output pulse of accumulated charge. It is therefore respectfully submitted that Misawa thus does not have a CMOS image sensor with an array of pixels arranged into rows and column wherein in a battery charging mode a “timing/control circuit directs multiple pixels in each individual column to simultaneously and continuously provide continuous current to the battery charger” as required by claim 1 (emphasis added). For similar reasons, claims 10 and 21 are also patentable over Misawa.

Tian was cited only in regards to original dependent claims 4, 6, 12, and 14. however it is noted that Tian also would not guide one of ordinary skill to transition from a row-by-row readout to outputting current from multiple pixels in each column continuously and simultaneously. Moreover, Tian would not guide one in the art to directly switch between an image capture mode and a battery charging mode.

In view of the foregoing amendments and remarks, it is respectfully submitted that the application is now in condition for allowance. The Examiner is invited to contact the undersigned if there are any residual issues that can be resolved through a telephone call.


The Commissioner is hereby authorized to charge any appropriate fees to Deposit Account No. 50-1283.

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